MEMOIRS

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

AT

HARVARD COLLEGE.

VOL. XXVIII.

PLATES.

I.

CAMBRIDGE, U.S.A.
PRINTED FOR THE MUSEUM.
1903.

1923

1903

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University Press :
John Wilson and Son, Cambridge, U. S. A.

CONTENTS.

REPORTS ON THE SCIENTIFIC RESULTS OF THE EXPEDITION TO THE TROPICAL PACIFIC, in charge of ALEXANDER AGASSIZ, by the U. S. Fish Commission Steamer "Albatross," from August, 1899, to March, 1900, Commander JEFFERSON F. MOSER, U. S. N., Commanding. IV. THE CORAL REEFS OF THE TROPICAL PACIFIC. By ALEXANDER AGASSIZ. pp. xxxiii., 410. 238 Plates. February, 1903.

ONE VOLUME TEXT. THREE VOLUMES PLATES.

Memoirs of the Museum of Comparative Zoölogy
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IV.

THE CORAL REEFS

OF THE

TROPICAL PACIFIC.

By ALEXANDER AGASSIZ.

I. — PLATES 1 TO 105.

CALIFORNIA TO SOCIETY ISLANDS.

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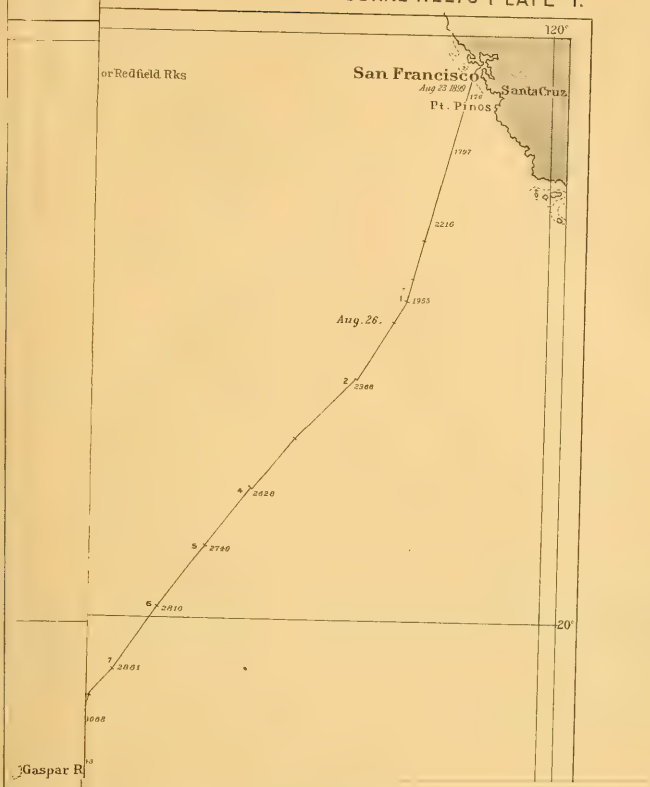
192345

PLATE 1.

Plate 1.

Chart of the Pacific Ocean, showing the track of the United States Fish Commission Steamer "Albatross" during her expedition to the Tropical Pacific from August, 1899 to March, 1900.

Coral Reefs Plate 1.



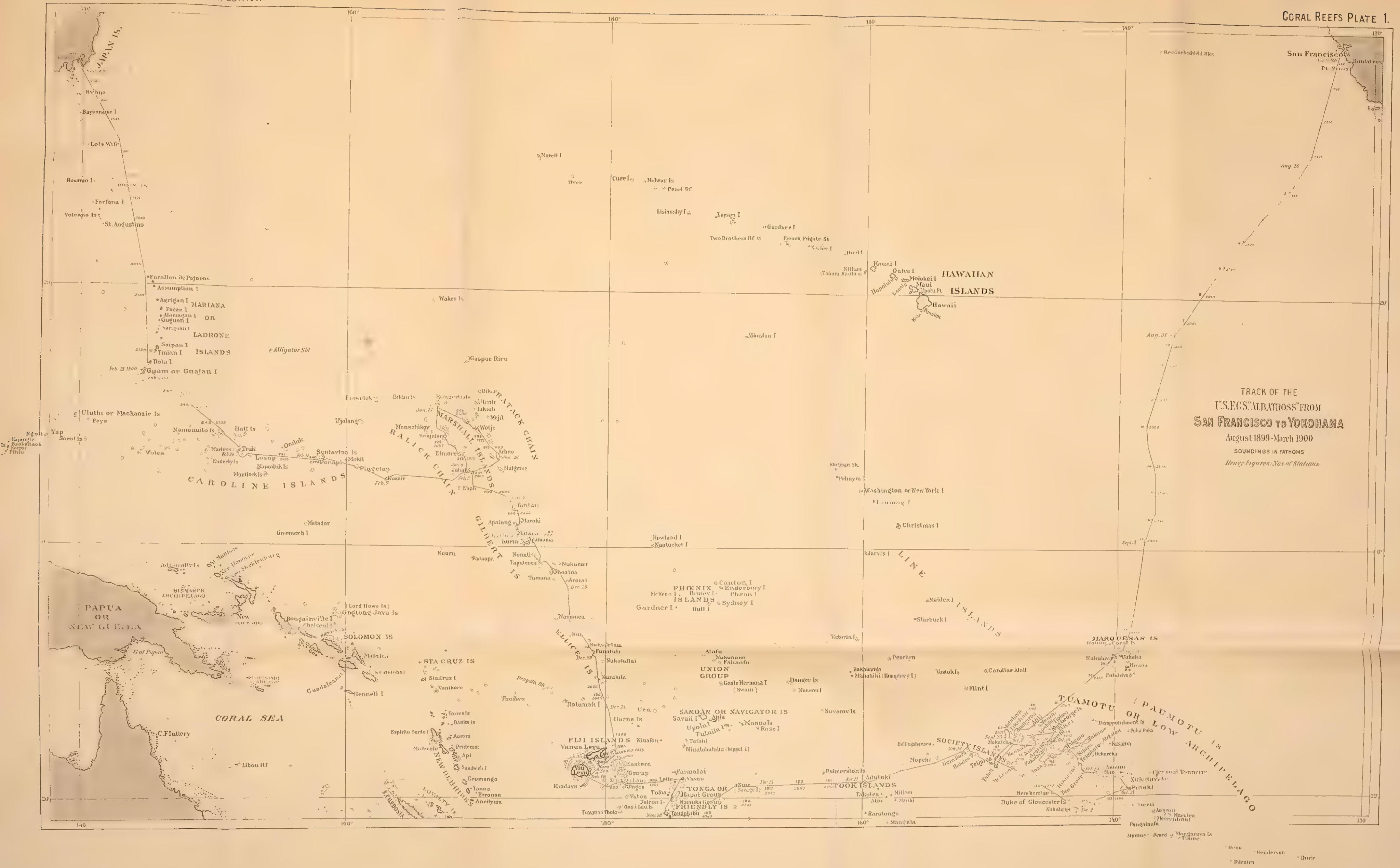

TRACK OF THE
U.S.F.C.S. "ALBATROSS" FROM
SAN FRANCISCO TO YOKOHAMA
August 1899-March 1900
SOUNDINGS IN FATHOMS
Heavy Figures: Nos. of Stations
JAPAN IS.
San Francisco
HAWAIIAN ISLANDS
Kauai I
Oahu I
Molokai I
Maui
Hawaii
Honolulu
MARIANA OR LADRONE ISLANDS
Guam or Guajan I
CAROLINE ISLANDS
RATACK CHAIN
RALICK CHAIN
MARSHALL ISLANDS
GILBERT IS
ELLICE IS
PHŒNIX ISLANDS
LINE ISLANDS
MARQUESAS IS
TUAMOTU OR LOW ARCHIPELAGO
(PAUMOTU IS)
SOCIETY ISLANDS
COOK ISLANDS
SAMOAN OR NAVIGATOR IS
UNION GROUP
TONGA OR FRIENDLY IS
FIJI ISLANDS
NEW HEBRIDES
STA CRUZ IS
SOLOMON IS
BISMARCK ARCHIPELAGO
PAPUA OR NEW GUINEA
CORAL SEA
C. Flattery
Midway Is
Wakes Is
Johnston I
Palmyra I
Washington or New York I
Christmas I
Howland I
Jarvis I
Canton I
Enderbury I
Sydney I
Gardner I
Ponapi
Kusaie
Truk
Yap
Nauru
Funafuti
Rotumah I
Vanua Levu
Viti Levu
Kandavu
Tongatabu
Vavau
Rarotonga
Tahiti
Pitcairn
Mangareva Is
Henderson
Ducie
Guadalcanar
Malaita
Bougainville I
Ongtong Java Is
Aug 26
Aug. 31
Sept. 7
Feb. 21 1900
140°
160°
180°
20°
0°

PLATE 2.

Plate 2.

MARQUESAS.

1. Cliffs to the west of the entrance to Taï-o-haé Bay (Anna Maria Bay).

W. McM. Woodworth, Phot.

2. Eroded volcanic rocks near Taï-o-haé Bay.

1

HELIOTYPE CO., BOSTON.

2

PLATE 3.

PLATE 3.

MARQUESAS.

Head of Taí-o-haé Bay. H. C. Fassett, Phot.

HELIOTYPE CO., BOSTON

PLATE 4.

Plate 4.

RANGIROA.

1. Avatoru Pass seen from the sea, Brander Island on one side of pass.

Max. Agassiz, Phot.

2. Shingle and sand beach on the east side of Avatoru Pass. W. McM. W., Phot.

1

2

HELIOTYPE CO., BOSTON.

PLATE 5.

PLATE 5.

Shingle beach on the west side of Avatoru Pass, Rangiroa. M. A., Phot.

HELIOTYPE CO., BOSTON.

PLATE 6.

Plate 6.

RANGIROA.

1. Lagoon shore, east side of Avatoru Pass.

2. Beach of lagoon east of Atimaro village, opposite the anchorage.

1, 2, M. A., Phot.

1

2

HELIOTYPE CO., BOSTON.

PLATE 7.

Plate 7.

RANGIROA.

1. Mohican Island and spit connecting it with Brander Island. M. A., Phot.

2. Western spit of Mohican Island reaching into the lagoon, seen looking towards Avatoru Pass, Brander Island on the left. H. C. F., Phot.

1

2

HELIOTYPE CO., BOSTON.

PLATE 8.

Plate 8.

RANGIROA.

1. First gap west from Tiputa, looking west, sea face of the land rim.

2. Sea face of same, looking south, to show old ledge and channel of gap.

1, 2, M. A., Phot.

1

2

HELIOTYPE CO., BOSTON.

PLATE 9.

Plate 9.

RANGIROA.

1. First gap east from Tiputa, looking towards the sea face from the lagoon.

W. McM. W., Phot

2. Lagoon side of the first gap east from Tiputa. M. A., Phot.

1

HELIOTYPE CO., BOSTON.

2

PLATE 10.

Plate 10.

RANGIROA.

1. Lagoon side of the second gap west of Tiputa.

2. Looking seaward across the second gap west of Tiputa.

1, 2, W. McM. W., Phot.

1

2

HELIOTYPE CO., BOSTON.

PLATE 11.

Plate 11.

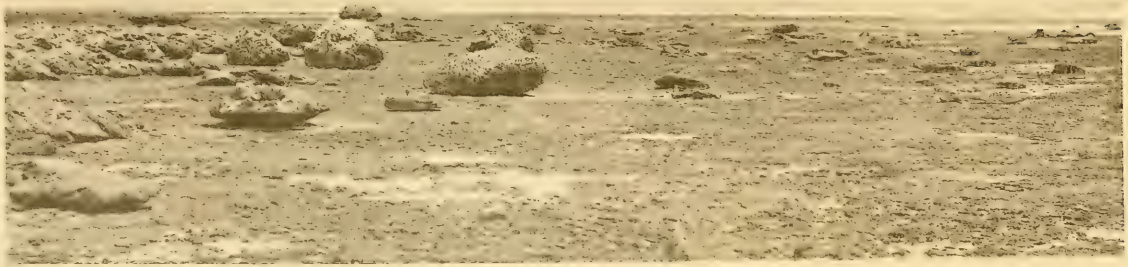
RANGIROA.

1. Coral boulder at the base of the sand beach on the edge of the third gap west of Tiputa Pass.

2. Sea face of the third gap west of Tiputa.

1, 2, M. A., Phot.

1



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HELIOTYPE CO., BOSTON.

PLATE 12.

Plate 12.

RANGIROA.

1. Looking into the lagoon from the west side of Avatoru Pass. M. A., Phot.

2. Sand beach and boulder flat on the sea face of the third gap west of Tiputa.
W. McM. W., Phot.

1

2

HELIOTYPE CO., BOSTON.

PLATE 13.

Plate 13.

RANGIROA.

1. West shore of Rangiroa north of Funuarua Island seen from the sea.

2. Looking towards the lagoon across the third gap west of Tiputa.

1, 2, M. A., Phot.

1

2

HELIOTYPE CO., BOSTON.

PLATE **14.**

Plate 14.

RANGIROA.

1. Islets and wall of old ledge on the south side of the western land rim.

2. Islets and wall of old ledge on the south side of the western land rim.

3. Islets and wall of old ledge on the south side of the western land rim.

1–3. W. McM. W., Phot.

1

2

3

HELIOTYPE CO., BOSTON.

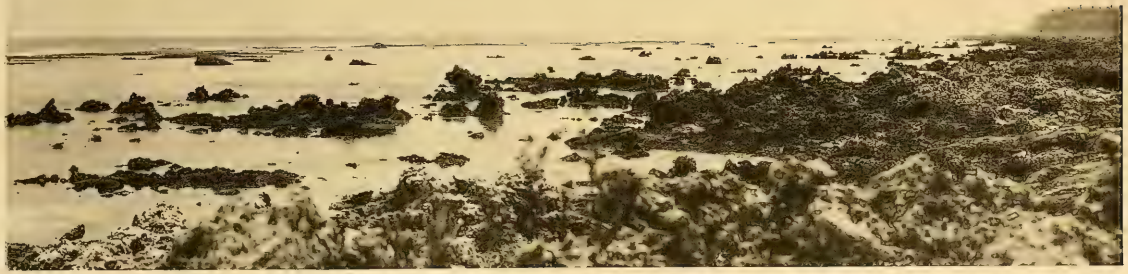
PLATE 15.

Plate 15.

RANGIROA.

1. South side of atoll, old ledge wall seen from the lagoon looking west.
W. McM. W., Phot.

2. South side of atoll, looking along the base of the old ledge sea wall from the reef flat platform. M. A., Phot.



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HELIOTYPE CO., BOSTON.

PLATE 16.

Plate 16.

RANGIROA.

1. Lagoon beach, south side of atoll. W. McM. W., Phot.

2. Gap in land rim, south side of atoll, seen from the lagoon side looking towards old ledge sea wall, outliers of sea wall protruding in the gap. M. A., Phot.

1

2

HELIOTYPE CO., BOSTON.

Plate **17**.

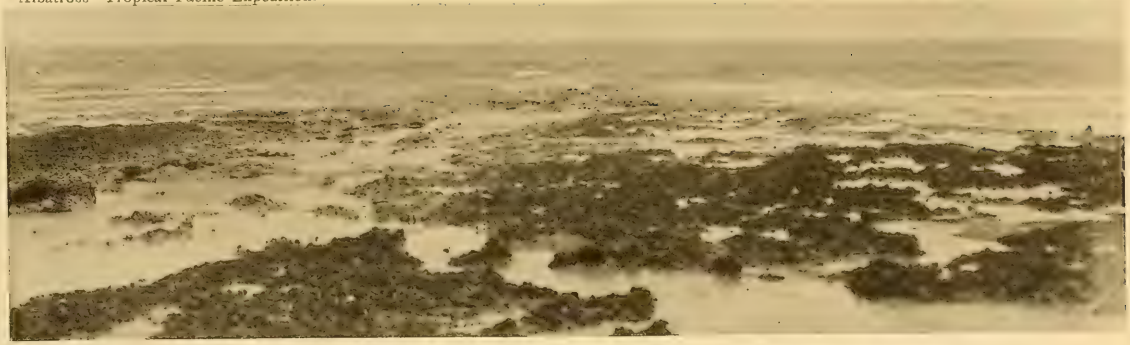
Plate 17.

RANGIROA.

1. Reef flat platform, sea face of south side of atoll, looking seaward.

2. Sea face of south side of atoll, looking along the base of the old ledge sea wall

1, 2, W. McM. W., Phot.



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HELIOTYPE CO., BOSTON.

PLATE **18**.

Plate 18.

RANGIROA.

1. South side of atoll, looking along the base of the old ledge sea wall. M. A., Phot.
2. Large blocks of Astrean and Porites *in situ* on small islet in middle of lagoon, south of Mohican Island. W. McM. W., Phot.

1

HELIOTYPE CO., BOSTON.

2

PLATE 19.

Plate 19.

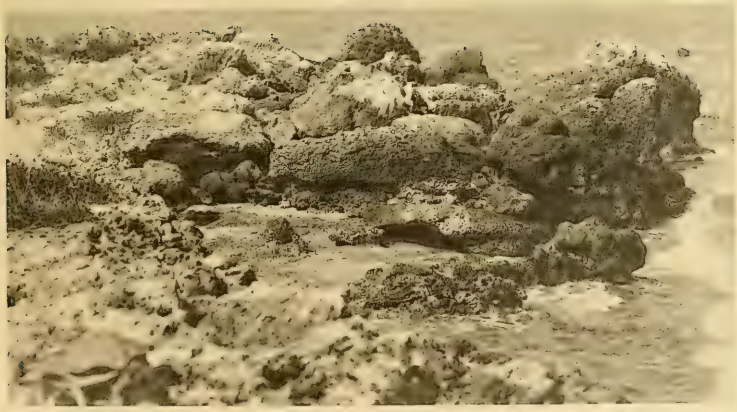
RANGIROA.

1. Old ledge on the shore of small islet in middle of lagoon.

2. Beach rock and recent coral boulders thrown up on the east shore of the same islet.

1, 2, W. McM. W., Phot.

1



2

HELIOTYPE CO. BOSTON

PLATE 20.

Plate 20.

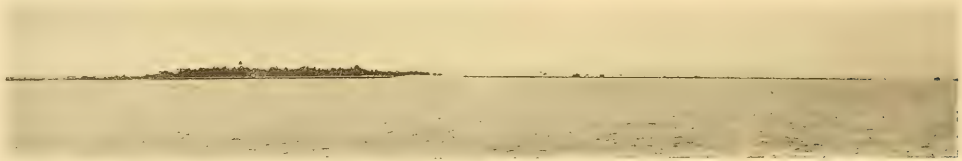
1. Entrance to Matahiva on northeast extremity of the atoll.
2. West shore of Tikahau, looking southeast.
3. Land rim and gap on the southwest shore of Tikahau.
4. Wide reef flat platform, southwest shore of Tikahau, looking southeast.

1–4, W. McM. W., Phot.

1

2

3



4

HELIOTYPE CO., BOSTON.

PLATE 21.

Plate 21.

MAKATEA.

1. Central part of west shore of the island. Cañon leading to the sink on the summit of the island is behind the village.

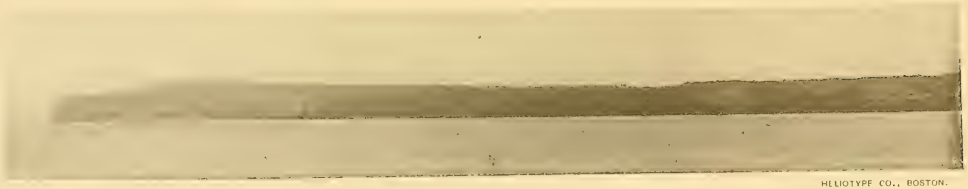
2. Lowest part of the west side of the island.

3. Northern point, seen from the west side.

1–3, W. McM. W., Phot.

1

2



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HELIOTYPE CO., BOSTON.

PLATE 22.

Plate 22.

MAKATEA.

1. Highest point of the island, seen from the west.

2. Northern point of the island, looking southeast; elevated coralliferous limestone.

1, 2, A. G. Mayer, Phot.

1

2

HELIOTYPE CO., BOSTON.

PLATE 23.

PLATE 23.

Elevated coralliferous limestone cliffs on the western face of Makatea, looking south.

A. G. M., Phot.

HELIOTYPE CO., BOSTON.

PLATE 24.

PLATE 24.

Cliffs on the western face of Makatea, looking north over the narrow reef flat platform.

A. G. M., Phot.

HELIOTYPE CO., BOSTON.

PLATE 25.

Plate 25.

Cliffs on the northern point of Makatea, looking over the reef flat platform.

W. McM. W., Phot.

HELIOTYPE CO., BOSTON.

PLATE 26.

Plate 26.

MAKATEA.

1. North point of the island, looking eastward.
2. West face of the island, showing the coral sand beach and the reef flat platform, looking south.

1, 2, W. McM. W., Phot.

1

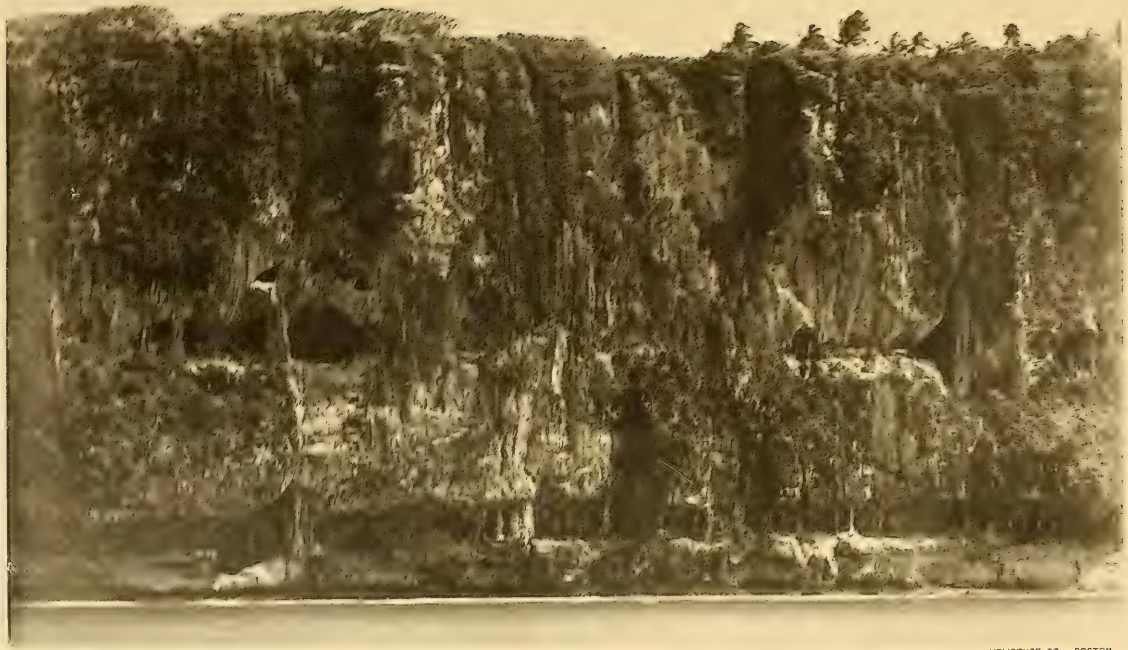
2

HELIOTYPE CO., BOSTON.

PLATE 27.

Plate 27.

Elevated coralliferous limestone cliffs on the east face of Makatea, south of the village, showing the undercutting at the base, the lines of caverns, and the stalactites along the face of the cliffs and over the openings of the caverns. W. McM. W., Phot.



HELIOTYPE CO., BOSTON.

PLATE 28.

Plate 28.

MAKATEA.

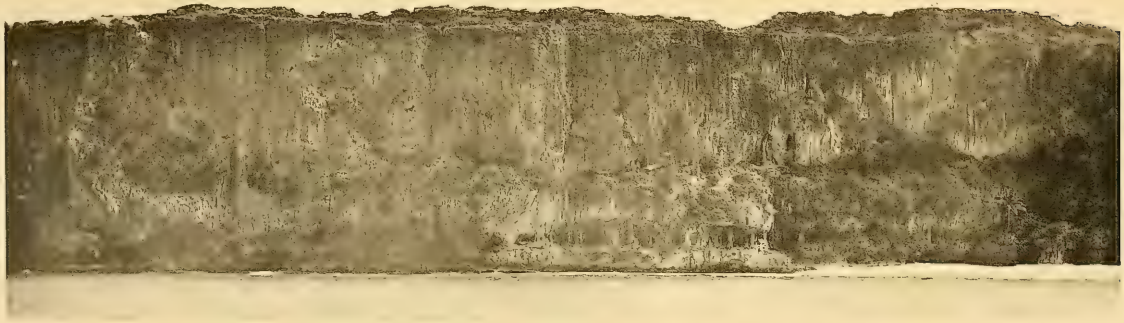
1. Cliffs on the east face of the island. The first terraces are sloughed off; long coral sand beach at the base of the cliffs, near the southern end of the island.

W. McM. W., Phot.

2. Cliffs on the east face of the island, with a short coral sand beach at the base; the lower terraces are beginning to slough off near the southern extremity of the island.

A. G. M., Phot.

1



2

HELIOTYPE CO., BOSTON.

PLATE 29.

Plate 29.

MAKATEA.

1. Showing the terraces on the south face of the island, with horses of elevated reef rock of the first terrace, separated by short coral sand beaches.

2. Terraces of the east face of the island, near the southern extremity, with beaches and horses of the old ledge.

3. Terraces of the east face of the island, with beaches and horses, near the southern end of the island.

1–3, A. G. M., Phot.

1

2

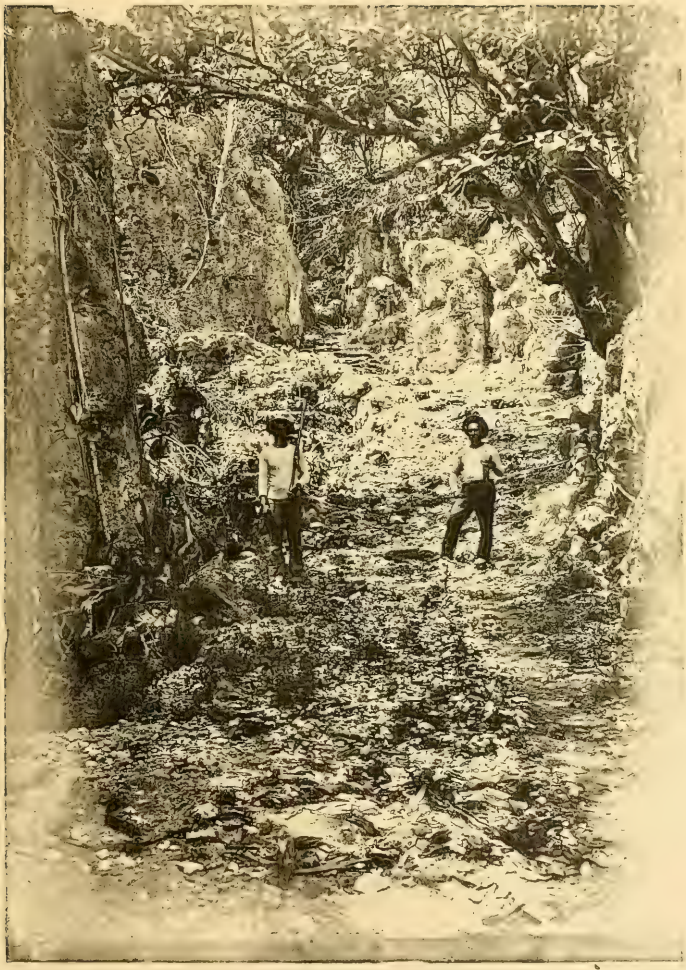
3

HELIOTYPE CO., BOSTON.

PLATE 30.

PLATE 30.

Cañon leading up the cliffs of the west face of Makatea to the path winding across the summit sink to the east face of the island. C. H. Townsend, Phot.



HELIOTYPE CO., BOSTON

PLATE 31.

Plate 31.

MAKATEA.

1. Cañon through the summit of the cliffs on the west side, opening on the path leading to the east side of the island.

2. Spires and pinnacles of old ledge along the path leading across the central plateau of the island.

1, 2, C. H. T., Phot.

2

HELIOTYPE CO., BOSTON

1

PLATE 32.

Plate 32.

MAKATEA.

1. Old ledge pinnacles in the central part of the sink of the island.

2. Old ledge pinnacles in the central part of the sink of the island.

1, 2, C. H. T., Phot.

1

2

HELIOTYPE CO., BOSTON.

PLATE 33.

Plate 33.

Reef flat platform, on the west shore of Niau, with undercut ledges and horses of elevated coralliferous limestone. A. G. M., Phot.

HELIOTYPE CO., BOSTON.

PLATE 34.

Plate 34.

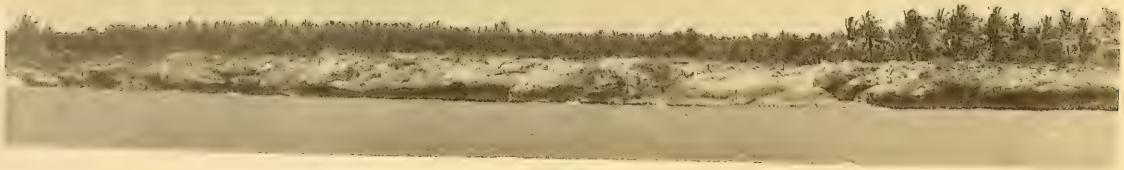
NIAU.

1. Outcrop of old ledge in the central part of the land rim of the island.
2. Outcrops of old ledge on the reef flat platform of the west face of the island.
3. Low undercut elevated coralliferous limestone bluffs on the south shore of the island.

1-3, W. McM. W., Phot.

2

1



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HELIOTYPE CO., BOSTON.

PLATE 35.

Plate 35.

NIAU.

1. Outcrop of old ledge near the lagoon, west face of the island.

2. Outcrop of old ledge near the lagoon, west face of the island.

1, 2, A. G. M., Phot.

1

HELIOTYPE CO., BOSTON.

2

PLATE 36.

PLATE 36.

Lagoon shore, west face of Niau; the old ledge crops out on the right. A. G. M., Phot.

HELIOTYPE CO., BOSTON.

PLATE 37.

Plate 37.

APATAKI.

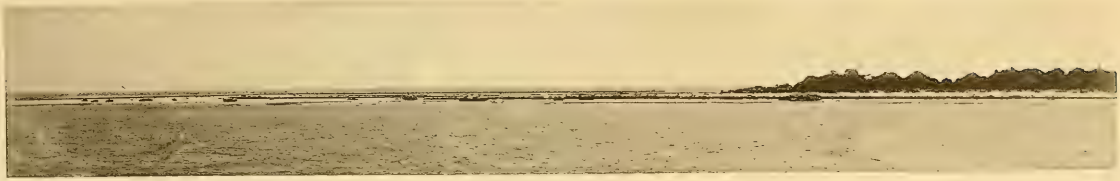
1. Southwest shore of atoll, seen from the sea, showing the low land rim, with its islands and islets and submerged flats.

2. Land rim with partly submerged flats.

3. Looking northwest, on lagoon side of land rim east of Pakaka Pass.

1–3, A. G. M., Phot.

1



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HELIOTYPE CO., BOSTON.

PLATE 38.

Plate 38.

APATAKI.

1. Pakaka Pass, seen from the sea, looking into the lagoon.

2. Gap across the land rim to the east of Pakaka Pass.

3. Looking out to sea, across Pakaka Pass, from the lagoon side.

1 3. A. G. M., Phot.

1

2

3

HELIOTYPE CO., BOSTON.

PLATE 39.

Plate 39.

APATAKI.

1. Low flats of the lagoon, east of Pakaka Pass.

2. Lagoon beach of land rim east of Pakaka Pass, looking northwest.

1, 2, W. McM. W., Phot.

1

2

HELIOTYPE CO., BOSTON.

PLATE 40.

Plate 40.

1. Vegetation of land rim, lagoon side of Apataki. C. H. T., Phot.
2. Boulder beach outside of channel leading to central sink of Tikeï.
3. West shore of Tikeï, south end of high coral sand beach.
4. West shore of Tikeï, north end of high coral sand beach.

2–4, W. McM. W., Phot.

1

2

3

4

HELIOTYPE CO., BOSTON.

PLATE 41.

Plate 41.

TIKEÏ.

1. Gap forming pass leading from the sea face to the interior sink.

2. Cut leading from gap to the inner sink.

1, 2, A. G. M., Phot.

1

2

HELIOTYPE CO., BOSTON

PLATE 42.

Plate 42.

Wide passage leading from the gap (Pl. 41, fig. 1) to the central pool of Tikeï.

A. G. M., Phot.

HELIOTYPE CO., BOSTON.

PLATE 43.

Plate 43.

TIKEI.

1. Marshy flat near the pool of the central sink. W. McM. W., Phot.

2. Marshy flat connecting the central sink with the wide passage to the sea (Pl. 42).
A. G. M., Phot.

1

HELIOTYPE CO., BOSTON.

2

PLATE 44.

Plate 44.

Sink with pool showing an outcrop of the old ledge, near the central part of Tikeï.

A. G. M., Phot.

HELIOTYPE CO., BOSTON.

PLATE 45.

Plate 45.

KAUEHI.

1. West shore, seen from the sea, looking across the lagoon to the islands of the opposite face, showing masses of boulders flanked by elevated undercut ledges of coralliferous limestone.

2. Wide gap across the land rim of the west face of the atoll, seen from the sea.

A. G. M., Phot.

3. Mass of large boulders on the west face of the land rim, partly recent coral conglomerate, partly old ledge, still attached to the narrow reef flat platform.

1, 3, W. McM. W., Phot.

1

2

3

HELIOTYPE CO., BOSTON.

PLATE 46.

Plate 46.

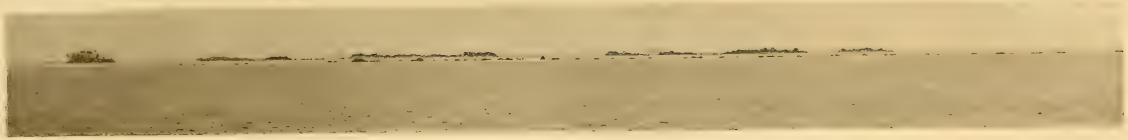
FAKARAVA.

1. Partly submerged land rim of the west face of the atoll, islands and islets of the northwestern part of the lagoon. A. G. M., Phot.

2. Island on east side of Ngarue Pass, looking east while in the pass.

3. Lagoon face of land rim, west of Rotoava village, showing the low beach rock beach, seen from the anchorage.

2, 3, W. McM. W., Phot.



1

2

3

HELIOTYPE CO., BOSTON.

PLATE 47.

Plate 47.

FAKARAVA.

1. Ledges, islets, and islands in northwestern part of atoll (Pl. 204), seen from the island nearest to the Rotoava anchorage.

2. Ledge in the lagoon between Ngarue Pass and Rotoava.

3. One of the islands of the cluster in the northwestern part of the lagoon, the one nearest to the Rotoava anchorage.

4. North face of the same island, flanked by old ledge rock, with ledge of the same seen in the distance.

1–4, W. McM. W., Phot.

1

2

3

HELIOTYPE CO., BOSTON.

4

PLATE 48.

PLATE 48.

Sink and pool south of Rotoava village, Fakarava. W. McM. W., Phot.

HELIOTYPE CO., BOSTON

PLATE 49

Plate 49.

Low beach rock cliffs of lagoon face of land rim near Rotoava village, Fakarava, part of Fig. 3, Pl. 46. A. G. M., Phot.

HELIOTYPE CO., BOSTON.

PLATE 50.

Plate 50.

FAKARAVA.

Sea face shingle beach with characteristic vegetation of the land rim of a Paumotu atoll.

A. G. M., Phot.

HELIOTYPE CO., BOSTON.

PLATE 51.

Plate 51.

1. Looking over the partly submerged land rim across to islets in the lagoon of Anaa, seen from the sea.

2. Beach rock on the sea face of the shingle beach to the east of Rotoava village, Fakarava, showing Nullipore knolls to the left of the reef platform.

1, 2, A. G. M., Phot.

1

2

HELIOTYPE CO., BOSTON.

PLATE 52.

Plate 52.

ANAA.

1. Northwest point of the atoll, showing undercut elevated coralliferous limestone ledges with outliers of the same on the reef flat platform. W. McM. W., Phot.

2. Gap on the northwest shore of the land rim, looking into the lagoon towards the land rim on the opposite face.

3. Horn and reef flat platform on the northwestern side of the atoll, seen from the sea.

2, 3, A. G. M., Phot.

1

2

3

HELIOTYPE CO., BOSTON.

PLATE 53.

Plate 53.

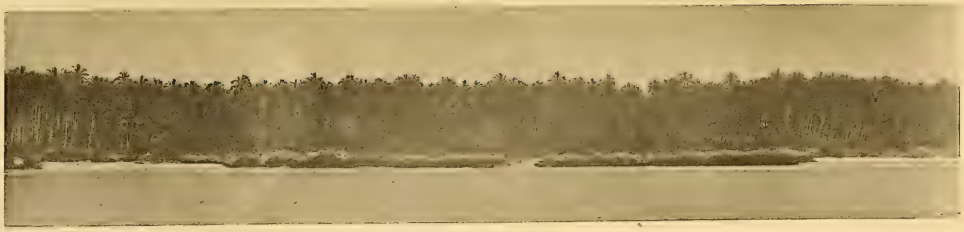
ANAA.

1. Part of the eastern shore flanked by low undercut elevated coralliferous limestone ledges and horses, separated by short coral sand beaches.

2. A more northerly part of the east face land rim, covered with small islands, separated by high gaps, with shingle beaches flanked by recent and old ledge boulders.

3. Submerged north face land rim with a prominent islet, looking across the shallow lagoon flat to the land rim of the opposite face.

1–3, A. G. M., Phot.



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HELIOTYPE CO., BOSTON.

PLATE 54.

Plate 54.

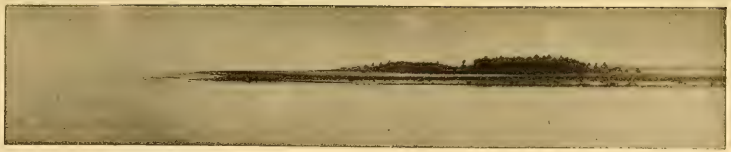
TAHANEA.

1. Island on the horn formed by the sweep of the reef flat platform on the west side of the atoll, seen from the sea.

2. Reef flat platform on the east face, at the curve leading to the southwest point, seen from the sea.

3. Southeast face of the atoll, seen from the sea, looking across the outer reef flat to the island on the inner platform of the secondary lagoon.

1, 2, W. McM. W.; 3, A. G. M., Phot.



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HELIOTYPE CO., BOSTON.

PLATE 55.

Plate 55.

TAHANEA.

1. Islands running at right angle to the face of the atoll, on the land rim of the southeast shore, seen from the sea. W. McM. W., Phot.

2. Islet and bars at right angle to the face of the atoll, on the west shore of the atoll, seen from the sea.

3. Narrow bare land rim of outer reef platform, on the north face of the atoll, seen from the sea.

4. Island and bars in the lagoon on the south face of the atoll, looking over the narrow land rim from the sea. The island is on the north side of the secondary lagoon.

2–4, A. G. M., Phot.

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HELIOTYPE CO. BOSTON

PLATE 56.

Plate 56.

TAKUME.

1. Looking across the horn of the north end of the atoll, seen from the sea.

2. Looking across the gap in the land rim of the northwest face of the atoll, island on the opposite face looming up, seen from the sea.

3. Looking into the lagoon across a low gap of the land rim on the northwest face of the atoll, seen from the sea.

1, 2, A. G. M.; 3, W. McM. W., Phot.

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HELIOTYPE CO., BOSTON.

PLATE 57.

Plate 57.

TAKUME.

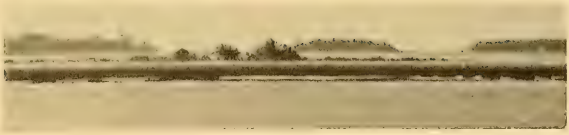
1. Islets on the land rim of the east face of the atoll, looking across the lagoon to the islands of the west face, seen from the sea.

2. Looking across a shallow gap in the land rim of the northwest side of the atoll, seen from the sea, breakers of the east face seen across the lagoon.

3. Boulders of old ledge on the northwest face of the atoll, looking across the lagoon, seen from the sea.

4. Islet and bars on the land rim at right angle to the east face of the atoll, islets of the west face seen across the lagoon, seen from the sea.

1–4, W. McM. W., Phot.



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HELIOTYPE CO., BOSTON.

PLATE 58.

Plate 58.

1. Land rim on the north side of Fakarava (lagoon face), distant ledges seen in the lagoon. A. G. M., Phot.

2. Looking into the lagoon of Takume across a narrow gap on the northwest face of the atoll. W. McM. W., Phot.

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HELIOTYPE CO., BOSTON.

PLATE 59.

Plate 59.

MAKEMO.

1. Looking across the pass on the northeast face, from the lagoon side.

2. Looking across the entrance to the same pass from the sea face, showing the outer shingle beach, the rolled boulders at the base, the narrow reef flat platform, and the outer edge of Nullipore knolls.

1, 2, W. McM. W., Phot.

1

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HELIOTYPE CO., BOSTON.

PLATE 60.

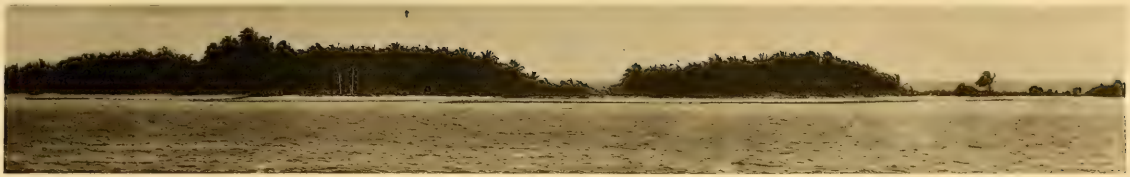
Plate 60.

MAKEMO.

1. Land rim of the northeast face of the atoll, broken by gaps, seen from the lagoon side.
A. G. M., Phot.

2. Continuous land rim on the northeast face of the atoll, seen from the lagoon side.

3. Sea face of the northeast land rim of the atoll, showing the shingle beach flanked by coral boulders at the base, the outer line of Nullipore knolls flanking the outer edge of the reef flat platform lagoon.
2, 3, W. McM. W., Phot.



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HELIOTYPE CO., BOSTON.

PLATE 61.

Plate 61.

MAKEMO.

1. Looking out to sea, from a low coral sand dam thrown across the lagoon face of a shallow gap, showing the shingle dam thrown across the sea face of the gap.

2. Looking towards the lagoon from the sea face of a gap of the land rim, across a narrow channel cut through old ledge rock capped with modern conglomerate.

1, 2, W. McM. W., Phot.

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HELIOTYPE CO., BOSTON.

PLATE 62.

Plate 62.

MAKEMO.

1. Shingle and rubble beach on the sea face, with line of Nullipore knolls on the outer edge of the narrow reef flat platform lagoon running parallel to the beach.

2. Sea face shingle beach with rolled coral boulders at the base, and outliers of the old ledge cropping out, on the reef flat platform, between the base of the shingle beach and the outer line of Nullipore knolls, forming the head of one of the reef flat platform lagoons.

1, 2, A. G. M., Phot.

1

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HELIOTYPE CO., BOSTON.

PLATE 63.

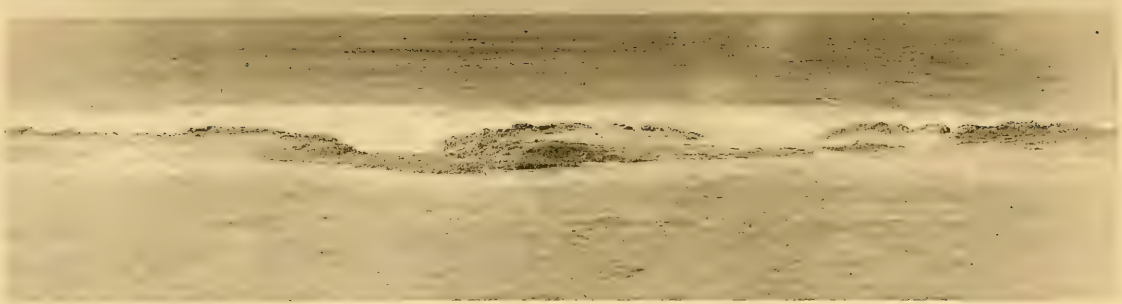
Plate 63.

MAKEMO.

1. Outer edge of knolls of Nullipores flanking the reef flat platform lagoon running parallel to the sea face shore line.

2. Sea face of atoll, showing the outer reef flat platform with its Nullipore edge, and base of the land rim flanked by a mass of material to form a conglomerate bedding covering the underlying old ledge.

1, 2, A. G. M., Phot.



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HELIOTYPE CO., BOSTON.

PLATE 64.

PLATE 64.

MAKEMO.

Coral shingle, rubble, and small boulders on the summit of the beach on the sea face, encroaching upon the vegetation of the land rim. A. G. M., Phot.

HELIOTYPE CO., BOSTON.

PLATE 65.

Plate 65.

MAKEMO.

1. Sea face, showing the outer line of Nullipore knolls forming the edge of the reef flat platform, covered with numerous outliers of the old ledge. A large undercut outlier of the old ledge, capped with recent conglomerate, stands on the left of the figure.

2. Worn recent corals, coral boulders, and fragments of old ledge on the face of the sea beach, capping the underlying old ledge.

1, 2, W. McM. W., Phot.

1

HELIOTYPE CO., BOSTON.

2

PLATE 66.

Plate 66.

TEKOKOTA.

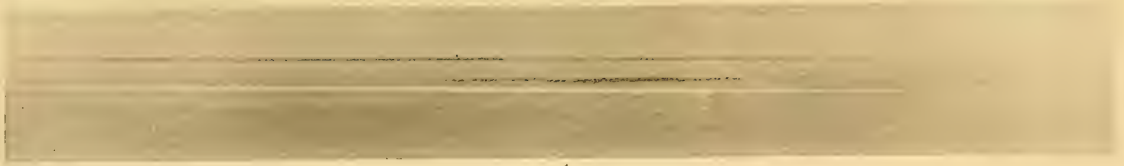
1. Looking across the lagoon of the atoll over the land rim of the west face, showing bar of shingle at right angle to the sea face.

2. Looking across the northwestern horn of the atoll.

3. Islets running at right angle to the reef platform of the west face of the land rim, looking across the lagoon of the atoll from the sea.

4. Looking across the land rim of the southwest face of the atoll, showing islet at right angle to the face, and the land rim of the opposite face.

1, 4, W. McM. W.; 2, 3, A. G. M., Phot.



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HELIOTYPE CO., BOSTON.

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PLATE 67.

Plate 67.

HAO.

1. A part of the west face of the atoll, with a wide reef flat; a few islands and bars form the land rim.

2. A part of the west face of the land rim, with islands and bars on the edge of the reef flat platform.

3. Northwest point of the atoll, looking across the horn of the lagoon, seen from the sea.

4. Wide gap on the west face of the atoll, looking into the lagoon from the sea.

1–4, A. G. M., Phot.

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HELIOTYPE CO., BOSTON.

PLATE 68.

Plate 68.

AKI-AKI.

1. Island of Aki-Aki seen from the south.

2. Western part of the island.

3. Eastern part of the island.

1–3, W. McM. W., Phot.

1

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HELIOTYPE CO., BOSTON.

3

PLATE 69.

Plate 69.

AKI-AKI.

1. Scrub vegetation of sink near the central part of the island.

2. Fresh-water sink surrounded by cocoanut trees, near the central part of the island.

1, 2, C. H. T., Phot.

1

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HELIOTYPE CO., BOSTON

PLATE 70.

Plate 70.

1. West face of Marokau, looking across the wide reef flat into the lagoon.

2. Northern extremity of Ravahere, looking across the wide bare reef flat of the west face, showing the islands on the east face of the atoll.

3. Horn of the western extremity of Nukutavake, showing reef flat platform lagoon at the base of a high shingle and coral sand beach, seen from the sea.

4. Sand dunes on the east face of Nukutavake, overwhelming the vegetation of the land rim, line of Nullipore knolls on outer edge of reef flat platform, seen from the sea.

1–4, A. G. M., Phot.

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HELIOTYPE CO., BOSTON.

PLATE 71.

Plate 71.

NUKUTAVAKE.

1. Vegetation near the central part of the island.

2. Sink surrounded by cocoanut trees, near the middle of the island.

1, 2, A. G. M., Phot.

1

HELIOTYPE CO., BOSTON

2

PLATE **72.**

Plate 72.

PINAKI.

1. Atoll seen from the foretop, showing the old gap on the southeast side.
W. McM. W., Phot.

2. Entrance to the atoll, seen from the south side. C. H. T., Phot.

3. Entrance to the atoll, seen from the south side. A. G. M., Phot.

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HELIOTYPE CO., BOSTON.

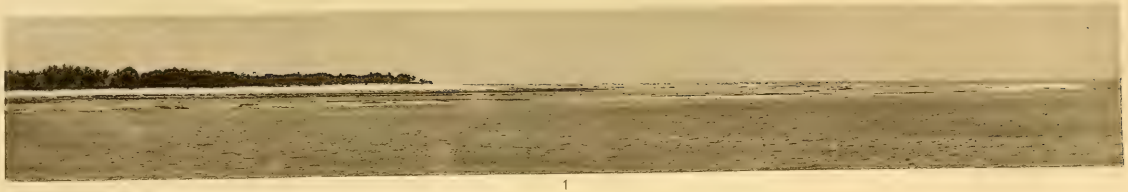
PLATE 73.

Plate 73.

PINAKI.

1. Western horn of the atoll.
2. Low gap across the eastern land rim of the atoll, seen from the southeast.
3. Sand dunes overwhelming the vegetation on the southeast face of the atoll, ancient wide gap on the right.

1–3, A. G. M., Phot.



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HELIOTYPE CO., BOSTON

PLATE 74.

Plate 74.

PINAKI.

1. Looking across the lagoon side of entrance into atoll, Tridacna islets in the background.

2. Looking into the lagoon of the atoll, from the reef flat platform, showing old ledge outcrops.

1, 2, C. H. T., Phot.

1

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HELIOTYPE CO., BOSTON

PLATE 75.

Plate 75.

1. Tridacna islets in the lagoon of Pinaki.
2. On the reef flat platform at the entrance into the lagoon of Pinaki, looking west.
3. Windrows of Tridacnas on the lagoon face of the land rim near the entrance into Pinaki.
4. Vegetation of the land rim of Makemo.

1–4, C. H. T., Phot.

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HELIOTYPE CO., BOSTON.

PLATE 76.

Plate 76.

NUKUTIPIPI.

1. Looking into the lagoon across the wide gap on the sea face of the land rim of the atoll; the reef flat platform lagoon runs parallel to the land rim; the land rim of the opposite face of the atoll is seen across the lagoon.

2. Extremity of island forming the land rim of the western face of the atoll; the reef flat platform lagoon is very prominent.

3. Northern end of island forming the west face of the atoll, looking into the lagoon from the sea.

4. Western point of the atoll as seen coming from the south. The reef flat platform lagoon is specially well developed at Nukutipipi, as shown on Figs. 1–4 of this plate.

1–4, A. G. M., Phot.

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HELIOTYPE CO., BOSTON.

4

PLATE 77.

Plate 77.

NUKUTIPIPI.

1. Looking across the broad reef flat platform lagoon on the south face of the atoll, with the edge of Nullipore knolls on the sea face of the reef flat.

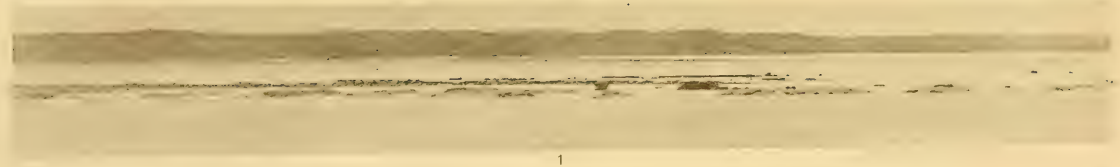
W. McM. W., Phot.

2. Looking into the lagoon to the opposite land rim, across the wide gap on the northwest face of the atoll.

3. Looking into the lagoon from the southwest, over the wide reef flat platform and the lagoon flat.

4. Looking across the reef flat platform lagoon, near the northwest point of the atoll.

2–4, A. G. M., Phot.



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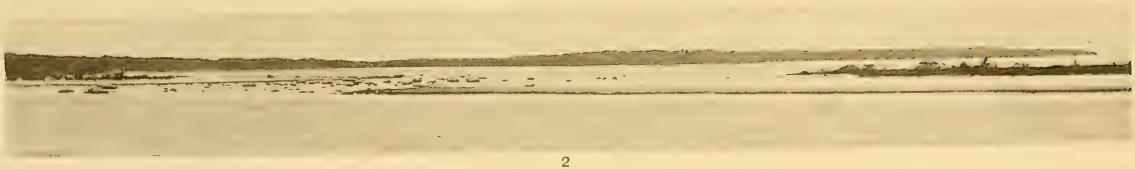

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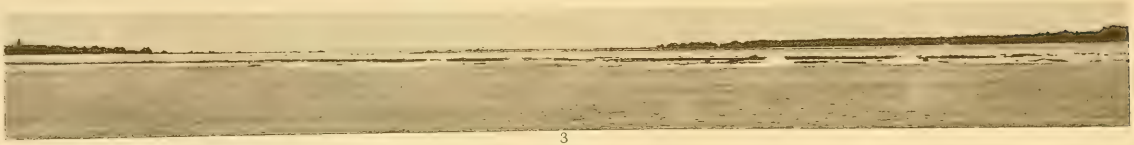

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HELIOTYPE CO., BOSTON.

PLATE 78.

Plate 78.

ANU–ANURUNGA.

1. Looking into the lagoon across the broad reef flat covered with rocky and sandy bars running at right angle to the face of the atoll. W. McM. W., Phot.

2. The northern extension of the same view. C. H. T., Phot.

3. Southwest face of the atoll, looking over the edge of Nullipore knolls, across the broad reef flat platform lagoon. A. G. M., Phot.

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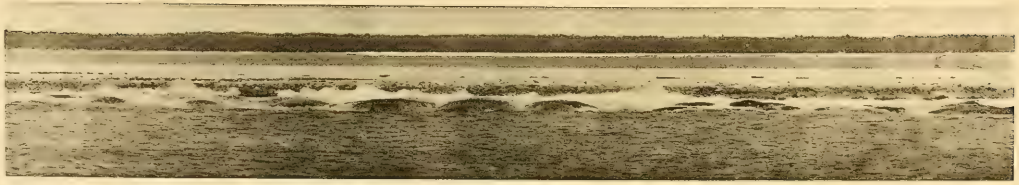

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HELIOTYPE CO., BOSTON.

PLATE 79.

Plate 79.

HEREHERETUE.

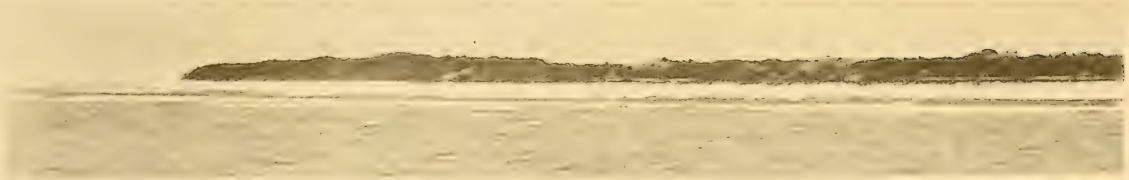
1. Looking into the lagoon over the reef flat platform and lagoon flats of the northeast face of the atoll.

2. The southeast horn of the atoll, showing the high coarse shingle beach, the narrow reef flat platform lagoon and low gap on the right.

3. Looking into the lagoon, through a wide gap, over a submerged reef flat on the western face of the atoll.

1 3, A. G. M., Phot.

1



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HELIOTYPE CO., BOSTON

PLATE 80.

Plate 80.

HEREHERETUE.

1. Looking over a narrow reef flat on the southeast face of the atoll, flanking a high coral sand beach overwhelming the vegetation of the land rim.

2. High sand and coral shingle beach flanking the southeast face of the atoll.

1, 2, W. McM. W., Phot.

1

2

HELIOTYPE CO., BOSTON

PLATE 81.

Plate 81

HEREHERETUE

1. High sand beach, flanked by narrow reef flat platform, encroaching on the vegetation of the land rim on the northeast face of the atoll, seen from the sea.

2. Looking across the narrow reef flat towards the high coral sand beach. The upper part of the beach is covered by low bushes, and the summit by trees that have been killed by sand dunes.

1, 2, W. McM. W., Phot.

1

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HELIOTYPE CO., BOSTON.

PLATE 82.

Plate 82.

HEREHERETUE.

1. Lagoon beach of the atoll.

2. Wide outer reef flat platform of the east face of the atoll, seen from the base of the outer coral sand and shingle beach.

1, 2, W. McM. W., Phot.

1

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HELIOTYPE CO., BOSTON.

PLATE 83.

Plate 83.

HEREHERETUE.

1. Long sand spit and belt of islets running north, in the interior of the lagoon, from the lagoon face of the land rim of the eastern face of the atoll.

2. Long sand spit, parallel with the outer face of the atoll, separating a shallow secondary lagoon from the main lagoon.

1, 2, W. McM. W., Phot.

1

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HELIOTYPE CO., BOSTON.

PLATE 84.

Plate 84.

TAHITI.

1. Looking out over the barrier reef of the east side of Papieté Harbor, Point Fareute on the right. W. McM. W., Phot.

2. Entrance of Papieté Harbor, Murea in the distance, Motu-uta on the right.
A. G. M., Phot.

3. Horn of the barrier reef on the west side of the entrance to Papieté Harbor, seen entering the harbor.

4. Horn of the barrier reef on the east side of the entrance to Papieté Harbor, seen entering the harbor.

3, 4, W. McM. W., Phot.

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HELIOTYPE CO., BOSTON.

PLATE 85.

Plate 85.

TAHITI.

1. Line of barrier reefs off the volcanic slopes of the east shore of Tahiti, off Bougainville Harbor and Boudeuse Pass.

2. Papieté, seen from our anchorage, with the volcanic slopes rising in the rear, "Reine" Valley in the centre.

1, 2, A. G. M., Phot.

1

HELIOTYPE CO., BOSTON.

2

PLATE 86.

Plate 86.

TAHITI.

1. Barrier reef off the northeast slope, connecting Motu Puuru and Nansouty Island.

2. Barrier reef off the east coast of the island, south of the Popeiha River (Hitiaa).

1, 2, A. G. M., Phot.

1

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HELIOTYPE CO., BOSTON.

PLATE 87.

Plate 87.

TAHITI.

1. Termination of the barrier reef off Puaiti opposite Utuofai River, on the east coast of the island.

2. Looking towards Papieté on the road to Point Venus, entrance to barrier reef south of Matavai Bay.

3. Taravao Bay, looking south, on the east face of Taiarapu Peninsula towards Motu Nono.

1, 2, W. McM. W., Phot.

1

2

HELIOTYPE CO., BOSTON.

3

PLATE 88.

Plate 88.

TAHITI.

1. Looking from the beach on the west face of Point Venus towards Mount Diadème in the central part of the island. W. McM. W., Phot.

2. Volcanic sand beach and cliffs at Papenu Point, north shore of the island.

1

HELIOTYPE CO., BOSTON.

2

PLATE 89.

Plate 89.

TAHITI.

1. Looking towards the centre of the island, Mount Diadème in the background.

W. McM. W., Phot.

2. Papieté from our anchorage, Fautaua Valley, with Mount Aorai in the rear.

A. G. M., Phot.

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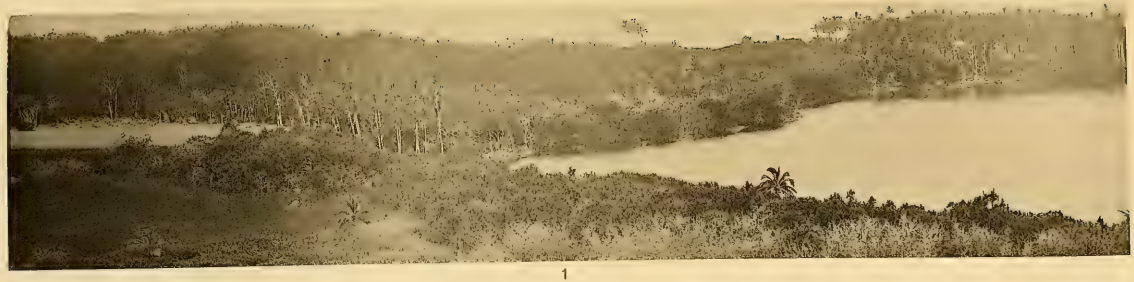
HELIOTYPE CO., BOSTON.

PLATE 90.

Plate 90.

1. Junction of lakes Temae and Motuiti, northeast point of Murea.
2. Mehetia, extinct volcano, seen from the north. A. G. M., Phot.



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HELIOTYPE CO., BOSTON.

PLATE 91.

PLATE 91.

MUREA.

1. Entrance to Paopao Bay, north side of the island.
2. The northeastern extremity of the island off Faaupo Point, showing the barrier reef enclosing lake Temae.

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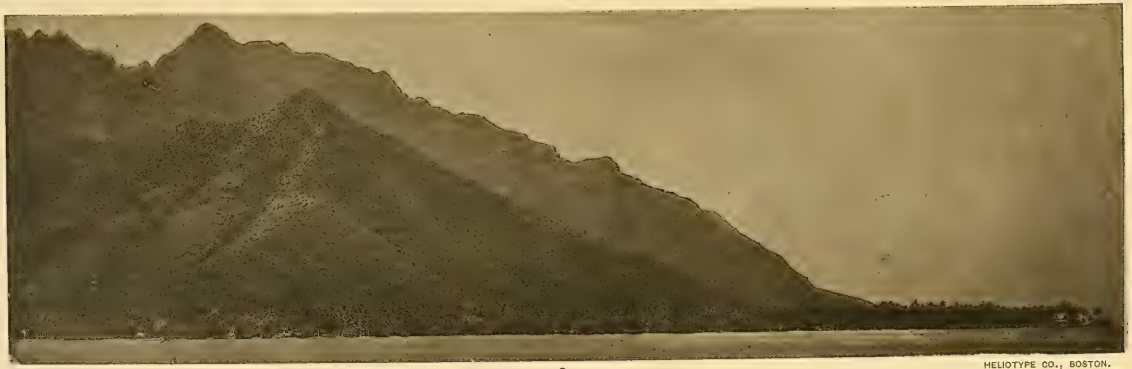

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HELIOTYPE CO., BOSTON.

PLATE 92.

Plate 92.

HUAHEINE.

1. Looking into Tiare Pass from the sea. W. McM. W., Phot.
2. Entrance to Tiare Pass, seen from the south. A. G. M., Phot.

1

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HELIOTYPE CO., BOSTON.

PLATE 93.

Plate 93.

TAHAA AND RAIATEA.

1. Gap between Tahaa and Raiatea.
2. Gap in the barrier reef, flanked with islets; off Fatira Bay on the north shore of Tahaa.
3. Looking into Teavarua Pass, Raiatea.

1, 2, W. McM. W.; 3, A. G. M., Phot.

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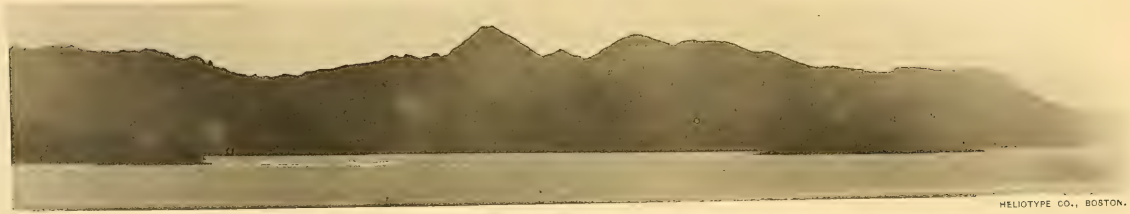

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HELIOTYPE CO., BOSTON.

PLATE 94.

Plate 94.

TAHAA.

1. Islets on the barrier reef of the northern face of the island, Bora Bora in the distance.
2. Looking southeast, through a gap in the barrier reef and islets on the northern face of the island.
3. Islet on the barrier reef of the horn of the northern end of the island.
4. The eastern face of Motu Oavarei, a wide island flanking the northern part of the east face of Huaheine.

1, 2, W. McM. W.; 3, 4, A. G. M., Phot.

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HELIOTYPE CO., BOSTON.

PLATE 95.

Plate 95.

1. Showing the steep slope of Mehetia with small coral sand beach of the island.

H. C. F., Phot.

2. Tetiaroa seen from the southeast.

3. Looking through a gap into the lagoon of Tetiaroa from the east.

2, 3, W. McM. W., Phot.

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HELIOTYPE CO., BOSTON.

Plate 96.

Plate 96.

1. Looking into the lagoon of Tetiaroa from the southeast. W. McM. W., Phot.

2. Looking across a gap in the barrier reef and islets of the northeast point of Tahaa.

3. Central mass of Bora Bora, seen from the north across the islets of the barrier reef.

2, 3, A. G. M., Phot.

1

2

HELIOTYPE CO., BOSTON

3

PLATE 97.

Plate 97.

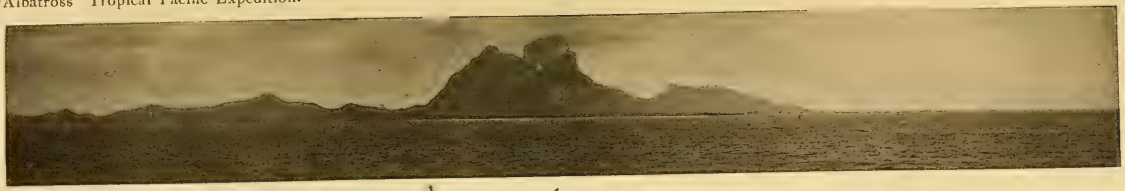
BORA BORA.

1. The island as seen approaching from the southeast, distant four miles.

2. The island seen from the northwest, looking across the islets and gaps of the barrier reef off the Manini Islands, northwest face of Bora Bora.

3. The island seen from the southeast, looking across the low part of the barrier reef off Taurere Point.

1, 2, W. McM. W.; 3, A. G. M., Phot.



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HELIOTYPE CO., BOSTON.

PLATE 98.

Plate 98.

BORA BORA.

1. Southeast face of the island, showing the barrier reef to the south, with Motu Piti Aau on the southeastern part of the barrier reef.

2. Gap in the islets and barrier reef of the southeast face of the island, off Motu Apomeo.

3. Looking into the lagoon of the barrier reef through a gap in Motu Piti Aau, southeast face of the island.

1-3, W. McM. W., Phot.

1

2

3

HELIOTYPE CO., BOSTON.

PLATE 99.

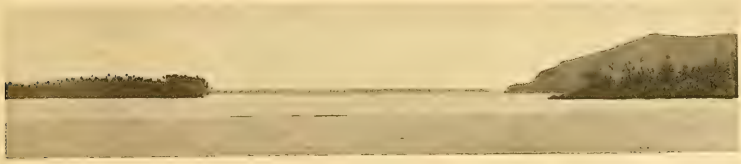
Plate 99.

BORA BORA.

1. Southern extremity of the island seen from the northeast.
2. Looking into the lagoon through a gap on the southeast face of the island.
3. Looking into the lagoon across the barrier reef, on the northwest face of the island
4. Looking west towards the central peaks of the island, over the islands on the barrier reef.

1, 2, W. McM. W.; 3, 4, A. G. M., Phot.

1



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HELIOTYPE CO., BOSTON.

4

PLATE **100**.

PLATE 100.

BORA BORA.

1. Central mass of the island, seen from the east, over the islands of the barrier reef, off Motu Itae.

2. Central mass of the island, seen from the northwest, over the islands of the barrier reef, off Motu Ome.

1, 2. W. McM. W., Phot.

1

2

HELIOTYPE CO., BOSTON.

PLATE **101**.

PLATE **101**.

BORA BORA.

1. Central mass of the island seen from the northwest, off Manini Islands.
W. McM. W., Phot.

2. Bora Bora seen from the west, looking into the entrance into the barrier reef lagoon; on the right Motu Tapu and Motu Ahuna, and on the left Teveiroa. A. G. M., Phot.

1

HELIOTYPE CO., BOSTON.

2

PLATE **102**.

Plate 102.

BORA BORA.

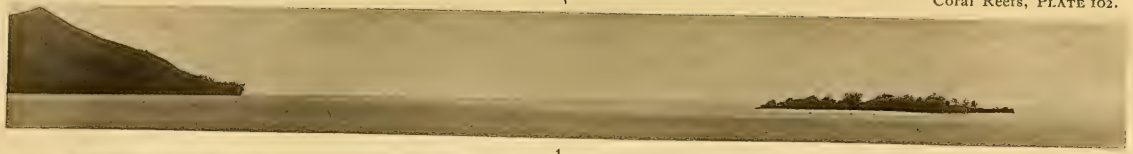
1. Northern extremity of Tupua Island seen from our anchorage off Vaitape, Motu Tapu on the right.

2. Southern extremity of Tupua Island seen from our anchorage.

3. Looking across the gap between Pahua Point and Motu Ahuna towards Teveiroa Island and the Manini Islands.

4. Looking across the gap between Pahua Point and Teveiroa Island.

1, 3, W. McM. W.; 2, 4, A. G. M., Phot.



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HELIOTYPE CO., BOSTON.

PLATE 103.

PLATE 103.

The central mass of Bora Bora, Mounts Pahia and Temanu seen from our anchorage off Vaitape. A. G. M., Phot.

HELIOTYPE CO., BOSTON.

PLATE **104**.

Plate 104.

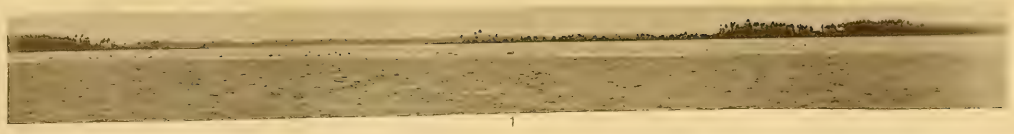
1. Looking into the lagoon of Motu Iti across the southern reef flat.

2. Looking into the lagoon of Motu Iti over the reef flat of the western face of the atoll.

3. Maupiti, seen from the east.

4. Maupiti, seen from the southeast, off Farepaia, looking over the barrier reef south of Tuanaé Island, towards its northern face.

1, 2, 4, A. G. M.; 3, W. McM. W., Phot.



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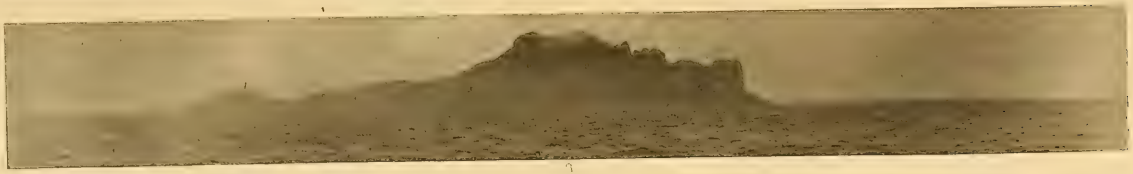

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HELIOTYPE CO., BOSTON.

PLATE 105.

Plate 105.

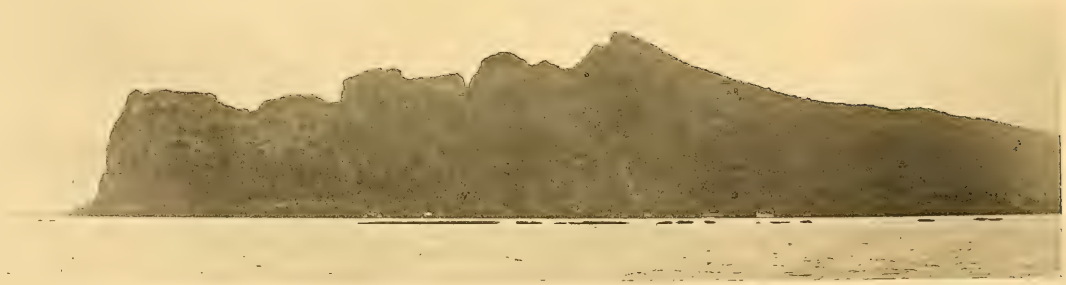
MAUPITI.

1. Central peak seen from the east, looking over Tuanaé Island.

2. The central mass seen from the east, looking over the barrier reef flats between Farepaia and Té Apaa Island.

1, 2, W. McM. W., Phot.

1



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HELIOTYPE CO., BOSTON.

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